with us?' These are they that retard by just so much the coloring of the ocean."

"Nay, father," said I, "be not angry with them. It is but natural. Remember that they do not know."

"True," said he, and his face grew kind and pitiful, "they do not know."

Said I: "Suppose some great falling rock should crush these creatures out of existence?"

"But the color!" said the old man, "the color cannot be crushed out of existence! And the ocean is so vast—there may be other colonies elsewhere; and even if there be none now, they may in time arise as this colony has done, I know not how. The ocean will be colored!"

I was silent a long time. Then I happened to think of my first question, which still remained unanswered.

"Tell me, father," said I, "what is the name of this ocean?"

"I have never heard but one name for it," said he, "and that is the name given it by these creatures themselves. 'Tis a strange name; there is no exact equivalent for it in our language. The nearest is Energy-of-the-Universe."

"And what do they call this beautiful color?"

"They are not agreed upon a single name. Some call it Consciousness, and some call it Soul."

PALEONTOLOGY.—*New genera of North American brachiopods.*[1] G. Arthur Cooper, U. S. National Museum.

In preparing the brachiopod chapter for the forthcoming "Index to North American Fossils," the writer encountered a number of nomenclatorial problems which are here adjusted. It also became evident that a number of new generic names should be proposed for groups of species not yet adequately designated. The generic diagnoses are given herewith without illustration, but most of these genera will be well figured in the forthcoming book. Besides the adjustment of certain homonyms and corrections of printer's errors, reasons for revival of erroneously suppressed names are given. Inasmuch as the "Index" will be in constant use by students the suggested changes should make for clearer understanding and stability in brachiopod nomenclature.

ADJUSTMENT OF HOMONYMS

Callipleura n. name, to replace *Cyclorhina* Hall and Clarke (1894, p. 146); not Peters, 1871, mammal. Genotype: *Rhynchospira nobilis* Hall, 1860.

Plectospira n. name, to replace *Ptychospira* Hall and Clarke (1894, p. 112); not Slavik, 1869, gastropod. Genotype: *Terebratula ferita* von Buch, 1834.

Pustulina n. name, to replace *Vitulina* Hall (1860, p. 72); not Swainson, 1840, gastropod. Genotype: *Vitulina pustulosa* Hall, 1860.

Trigonirhynchia n. name, to replace *Uncinulina* Bayle (1878, pl. 13, figs. 13–16); not Terquem, 1862, echinoderm. Genotype: *Uncinulina fallaciosa* Bayle, 1878.

Barroisella campbelli n. name, to replace *Lingula subspatulata* Meek and Worthen, 1868 (p. 437, pl. 13, fig. 1), the designated type of *Barroisella*, not *Lingula subspatulata* Hall and Meek, 1854–56.

ADJUSTMENT OF SYNONYMY

Dictyonina n. name, to replace *Iphidella* Walcott, 1912, not Walcott, 1905 (equals *Paterina*). In 1872 Billings proposed the genus *Iphidea* with *I. bella* Billings as genotype. The following year Meek proposed the genus *Micromitra* with *Iphidea* (??) *sculptilis* Meek as genotype. This name was not proposed as a substitute for *Iphidea* as suggested by Schuchert and Levene (1929, p. 69, 84) but as a separate genus. Such substitution did take place in 1905 by Walcott (p. 304), who distinctly states that *Iphidella* is proposed to replace *Iphidea* of Billings (not Bayly). From the list of species placed under *Iphidella* by Walcott it is clear that he had a very broad conception of the

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genus. In 1912 Walcott (p. 359) redefined the genus and selected another type species, *Trematis pannulus* White, a procedure contrary to the rules of nomenclature. The type of *Iphidella* is the type of *Iphidea*, i.e., *Iphidea bella* Billings. The genotype of *Iphidea* was placed by Walcott in the genus *Paterina*, which was proposed by Beecher in 1891 with *Obolus labradoricus* as genotype, a species that Billings (p. 478) had already assigned to *Iphidea*. It is therefore apparent that *Iphidea* and *Paterina* are generically identical. Inasmuch as *Iphidea* was stillborn, the name *Paterina* must now be used for these shells. *Iphidella* thus becomes a synonym of *Paterina*, leaving Walcott's *Iphidella* without a name, for which *Dictyonina* is proposed.

REVIVED NAMES

Craniops Hall (1859, p. 84) revived and substituted for *Pholidops*. The name *Craniops* appeared first in a list under a heading "Changed Names, Remarks, etc." and was used for the species *Orbicula* (?) *squamiformis* Hall. Its next use was in the advance copies of the *Paleontology of New York* 4. 1867, but did not appear in the final copy. In 1860 (p. 92) Hall published the name *Pholidops* as a new genus and cited *Orbicula* ? *squamiformis* as the first species, and this was later fixed as type by S. A. Miller, 1889. Inasmuch as *Craniops* and *Pholidops* are exact and objective synonyms, the former name has priority over the latter. The use of *Craniops* in a list with a described species was a valid proposal of a name at that time.

Stenocisma revived and substituted for *Camerophoria*. The conditions under which this name was proposed and the subsequent history are discussed fully by Dall (1877, p. 65) and need not be repeated here. Conrad clearly designated *Terebratula schlotheimi* von Buch as type of his genus and this designation must stand.

Orthambonites revived and used for certain brachiopods hitherto referred to *Orthis*. *Orthambonites* Pander, 1830, type *O. transversa* Pander, is to be used for costate Orthidae having both valves convex. The genus generally has been regarded as a synonym of *Orthis*, but the latter was restricted to species of the type of *O. callactis* with concave dorsal valve. The writer therefore revives the name *Orthambonites* for the biconvex species common in the Lower and Middle Ordovician of this country and Europe.

Resserella replaces *Dalmanella* as restricted by Schuchert and Cooper. The status of *Dalmanella* was thrown into confusion when Schuchert and Cooper (1932, p. 126) erroneously stated the type species to be *Orthis testudinaria* Hall and Clarke, not Dalman, equals *O. rogata* Sardeson. According to the rules of nomenclature the type should be regarded as the species named by Hall and Clarke, i.e., *O. testudinaria* Dalman. As thus restricted a single species (*Dalmanella edgewoodensis* Savage) in this country conforms strictly to the type. This leaves many species hitherto referred to *Dalmanella* without a generic name. Öpik (1933) claims these species to be referable to *Onniella* Bancroft, but according to the writer's view most of them are not congeneric with *Onniella*, which is restricted, as at present known, to a few Richmond species. The Black River and Trenton Dalmanellas actually are conspecific with *Resserella*. Restriction of *Dalmanella* to species of the type of *D. testudinaria* makes Bancroft's genus *Wattsella* a synonym of *Dalmanella* s.s.

Torynifer recognized. This name was proposed by Hall and Clarke (1894, pl. 84) for a fragment of a dorsal valve which exhibits a peculiar concave hinge-plate and which they felt was so unusual that it must be named despite its fragmentary condition. In the National Museum the writer discovered specimens almost identical with Hall and Clarke's fragment, which come from Pierce Springs, Larue County, Ky. These prove *Torynifer* to be the dorsal valve of "*Reticularia*" *pseudolineata* (Hall). *T. criticus* is thus a synonym of "*R.*" *pseudolineata*, and the generic name may be applied to the American Mississippian "Reticularias." *Torynifer* possesses a deeply concave undivided hinge-plate attached to a long median septum, a feature unlike that of the British type of *Reticularia*, according

to diagrams of the genotype published by George (1932). In these no septum is indicated and the hinge-plate is divided like that of the martinias. *Torynifer* also possesses a flat deltidial plate in the ventral valve which is not indicated in the British *Reticularia*. The writer therefore proposes to use the name *Torynifer* for the American Mississippian species of *Reticularia*.

CORRECTIONS

Septothyris Cooper and Williams, 1935.—Although this genus is monotypical, a printer's error prevented an unambiguous designation of the type. The type designation does not appear under the heading "Genotype," which is in its correct place but is incorrectly offset as an incomplete center heading "*Septothyris* Cooper and Williams, n. sp." The fact that the incomplete center heading is the actual designation inadvertently offset and minus the specific name should be obvious. The type of *Septothyris* is *S. septata* Cooper and Williams.

Trematorthis Ulrich and Cooper 1938.—In Ulrich and Cooper's "Ozarkian and Canadian Brachiopoda" the heading "*Tremorthis* Ulrich and Cooper, nov." appears. This is a lapsus for *Trematorthis*, which is correctly spelled in all other parts of the text. Page proof in the writer's possession bears the correct heading *Trematorthis*.

NEW GENERA AND SPECIES

Longispina Cooper, n. gen.

Small, quadrate in outline; hinge forming widest part; concavo-convex; costate; ventral posterior margin provided with a few long spines extending outward nearly parallel to the hinge.

Ventral interior with strong teeth; delthyrium open; dental plates absent; muscular field large and with flabellate diductor impressions. Dorsal interior with elongate, compressed and bilobed cardinal process. Brachial processes obsolete, median ridge low. Pseudopunctate.

Genotype: *Chonetes emmetensis* A. Winchell, Rep. Lower Peninsula Michigan, 1866, p. 92. Winchell's types redescribed and figured by Ehlers and Kline, Contr. Mus. Paleont. Univ. Michigan 4 (10): 156, 1934. Reference specimens U.S.N.M. nos. 108206a-d.

Differs from *Pliochonetes* Paeckelmann in great length of spines, absence of brachiophores, and presence of a median ridge. Species assigned here are: *Chonetes mucronatus* (Conrad), *C. robustus* Raymond, and *C. vicinus* (Castelnau).

Institella Cooper, n. gen.

Subrectangular in outline with hinge equal to about greatest shell width. Ventral valve with convex umbo, but anterior to the umbo appears a deep, narrow-sulcus that extends anterodorsally as a long sharp tongue. Flanks bounding sulcus convex with steep slopes to lateral margin. Dorsal valve with sulcate umbo, but anterior to umbo a narrow carinate fold occurs that rises anterodorsally to meet the ventral tongue. Lateral margins of ventral valve with a frill extending ventrally and outward. Dorsal valve with corresponding ventrally and outwardly directed frill. Ventral valve with short interarea and small delthyrium under the low beak.

Ventral interior with large flabellate diductors occupying deep cavities on each side of the median ridge formed on the inside by the sulcus. Adductors small, elongate, crenulate and located anterior to delthyrium on the median ridge.

Dorsal valve with thin median septum occupying internal groove produced by exterior fold. Adductor field small, located just anterior to cardinal process. Brachial impressions as in *Dictyoclostus* but small. Cardinal process erect bilobed.

Ventral valve with prominent spines along posterior margin and cardinal extremity where largest ones are located. Dorsal valve without spines. Surface costellate and reticulate.

Genotype: *Productus leonardensis* R. E. King, Univ. Texas Bull. 3042: 70, pl. 14, figs. 4–9. 1930. Reference specimens U.S.N.M. nos. 108549a-f.

Differs from *Dictyoclostus*, which it resembles externally, by the extravagant lateral flanges, the deep sulcus, carinate dorsal fold, and cardinal area of ventral valve.

Costellirostra Cooper, n. gen.

Subtriangular in outline, dorsal valve deeper than the ventral one, ventral beak with minute foramen just posterior to apex. Uniplicate; ventral valve with long anterior tongue. Valves multicostellate, impunctate.

Ventral interior with short concave deltidial plates; teeth stout, supported by callus. Muscular field elongate oval with large diductor impressions. Adductors nearly central, attached to small platform. Dorsal interior with long thick cardinal process; myophore having two long outer prongs and two shorter inner ones. Crura short and stout, extending anteroventrally from base of shaft. Median ridge long and thick.

Genotype: *Atrypa peculiaris* Conrad, 5th Ann. Rep. Geol. Surv. New York, 1841, p. 56. Reference specimens U.S.N.M. nos. 95547a, 108209a-c.

Differs from *Eatonia* by its multicostellate ornamentation, more flabellate ventral muscular area and more extravagantly developed cardinal process. Other species are *E. singularis* (Vanuxem) and *E. tennesseensis* Dunbar.

Paurorhyncha Cooper, n. gen.

Large, subtriangular, with unequally deep valves, the ventral one slightly convex but the dorsal one very deep; uniplicate; multicostellate.

Ventral interior with much reduced dental plates and small teeth. Muscular area small, elongate-oval. Foramen minute, beak closely pressed onto dorsal umbo. Deltidial plates vestigial. Dorsal interior with long median septum supporting a small V-shaped chamber to which the divided hinge-plate is attached. Socket plates elevated, crural bases concave, often swollen.

Genotype: *Rhynchonella endlichi* Meek, Bull. U. S. Geol. Surv. Terr. (ser. 2) **1**: 46. 1875. Syntype U.S.N.M. no. 7798a; dorsal interior U.S.N.M. no. 108213.

Differs from *Leiorhynchus* in the presence of a deep V-shaped chamber. From *Plethorhyncha* it differs in the slighter development of the dorsal median septum, smaller ventral muscular field and mode of thickening of hinge-plate.

Sedenticellula Cooper, n. gen.

Small, rhynchonelloid, with ventral sulcus and dorsal fold. Surface multicostate with costate increasing in number by intercallation. Ventral interior with sessile spondylium; dorsal interior with long median septum, and small cruralium divided by a median septum.

Genotype: *Camarophoria hamburgensis* Weller, Bull. Geol. Soc. Amer. **21**: 500. 1910.

Distinguished from *Camarophoria* by its leiorhynchoid exterior and sessile spondylium.

Brevispirifer Cooper, n. gen.

Medium sized, generally longer than wide, with hinge equal to or slightly wider than midwidth. Valves costate, lamellose; fold and sulcus noncostate.

Ventral interior with strong, short, flaring dental plates. Muscular area oval. Dorsal socket-plates confined to sides of valve and attached to floor by short supporting plates. Cardinal process absent.

Genotype: *Spirifer gregaria* Clapp, in Hall, 10th Rep. New York State Cab. Nat. Hist., 1857, p. 127. Reference specimens U.S.N.M. nos. 108216a-c.

This genus suggests *Mucrospirifer* but is longer than wide and possesses supporting plates in the dorsal valve. Besides the type, *S. lucasi* Stauffer and *S. davisi* Nettelroth are assigned here.

Fimbrispirifer Cooper, n. gen.

Wider than long with narrowly rounded sides; valves multicostate with fold and sulcus costate. Entire surface marked by concentric lamellae, each bearing a single row of small spines. Ventral interior with strong dental plates. Dorsal interior with shallow narrow socket-plates that converge toward the center and join a callosity under the beak. Median ridge low.

Genotype: *Spirifer venustus* Hall, 10th Rep. New York State Cab. Nat. Hist., 1857, p. 133. Reference specimens U.S.N.M. nos. 39489a, 108217a.

Suggests the completely costate *Costispirifer* but differs in presence of concentric lamellae and spines and inside the dorsal

valve in the presence of short supporting plates. *Paraspirifer* possesses similar spiniferous lamellae but the fold and sulcus are noncostate. *S. divaricatus* Hall and *S. grieri* Hall belong here.

Costispirifer Cooper, n. gen.

Large, spiriferoid in outline and profile; multicostae with costate fold and sulcus. Costae flat and marked by fine radial costellae. Ventral teeth small, dental plates short and thick. Delthyrium covered by a short convex pseudodeltidium. Dorsal valve with stout, shallow socket plates restricted to the side of the valve and supported by callus only.

Genotype: *Spirifer arenosus planicostatus* F. M. Swartz = *Costispirifer planicostatus* (Swartz), U. S. Geol. Surv. Prof. Paper 158-C: 56. 1929. Reference specimens U.S.N.M. nos. 97942a-c, 97943a, b.

Differs from *Fimbrispirifer* by its broad flat costae, covered by radial costellae and absence of any plates supporting the socket plates. *Spirifer arenosus* (Conrad) and *S. unicus* Hall are also placed here.

Dimegelasma Cooper, n. gen.

Large, spiriferoid in outline and profile with smooth fold and sulcus; flanks costate. Shell substance coarsely endopunctate. Ventral interior with long, strong dental plates. Delthyrium partially covered by a flat delthyrial plate. Muscular field long and oval. Dorsal valve with crural bases attached to sides of valve and united medially to a short low septum.

Genotype: *Spirifer. neglectus* Hall, Geol. Surv.Iowa 1 (pt. 2): 643, pl. 20, fig. 5. 1858. Reference specimens U.S.N.M. nos. 49163a, b; 108218.

Differs from the Permian genus *Spiriferella* with which it has been confused by its endopunctate shell, elongate dental plates, and flat delthyrium. The Russian *Spiriferella* is impunctate, the dental plates are short, and the pseudodeltidium is convex.

Spondylospira Cooper, n. gen.

Shell cyrtinoid in outline with costellate fold and sulcus. Ventral valve hemipyramidal, delthyrium open; surface of interarea deeply striated at right angles to the hinge, the ridges between the striae representing growth tracks of teeth on the hinge margin. Interior of ventral valve with dental plates and median septum grown together to form a cyrtinoid spondylium, in which the median septum extends posterodorsally into the chamber formed by the spondylium. Dorsal interior with short and low median ridge, small crural bases. Descending lamellae of spire supported by a calcareous net. Shell substance punctate, exterior granulose.

Genotype: *Spondylospira reesidei* Cooper, n. sp.

Resembles *Cyrtina* in outline and profile but differs in having a costate fold and sulcus, dentate cardinal edge, no deltidial plate, and the descending lamellae of the spire supported by a calcareous net. Besides the genotype, *Spiriferina alia* Hall and Whitfield and *Cyrtina lewesensis* Lees are placed here.

Spondylospira reesidei Cooper, n. sp.

Small, cyrtinoid in outline and profile; wider than long. Ventral valve hemipyramidal, beak often twisted. Costae bifurcating anteriorly. Sulcus shallow, occupied by a costa that bifurcates near the front margin. Fold low, formed by a single costa on the umbo. This costa bifurcates about $2\frac{1}{2}$ mm anterior to the beak. The two costae thus produced then bifurcate near the middle of the valve to produce four costae, which extend to the margin. Flanks marked by six to nine costae.

Ventral interior with high median septum, and shallow spondylium. Dorsal interior having united jugum and descending branches of spire united to floor of valve by a calcareous net.

Holotype: U.S.N.M. no. 10346a. Paratypes: U.S.N.M. nos. 103468b-g.

Triassic (Seven Devils formation), east side of Mission Creek, $1\frac{1}{2}$ miles above Mission, $4\frac{1}{2}$ miles above Jaques, about sec. 15, T. 36 N., R. 3 W., Nez Perce County, Idaho.

Spondylospira reesidei differs from *S. alia* by its smaller size and stronger costae; it differs from *S. lewesensis* in having fewer costae in the fold and sulcus and more on the flanks.

Cryptothyrella Cooper, n. gen.

Large, elongate, lenticular in lateral profile, elliptical to subcircular in cross section. Anterior commissure rectimarginate to uniplicate. Beak strongly incurved; foramen minute, apical. Dorsal beak fitting into a concave plate under ventral beak. Surface smooth, shell substance impunctate.

Ventral interior with long divergent dental lamellae on each side of the elongate triangular muscle field. Dorsal interior with long median septum supporting divided hingeplate. Brachidium with compressed spiral cones and inverted Y-shaped jugum, the tail of the Y directed posteroventrally.

Genotype: *Whitfieldella quadrangularis* Foerste, Kentucky Geol. Surv. Bull. 7: 327, pl. 1, figs. 4a-c. 1906. Syntypes U.S.N.M. no. 84891.

Differs from *Whitfieldella* by the minute foramen, large triangular muscular field, and the elongate form of the valves.

Plectoconcha Cooper, n. gen.

Terebratuloid, generally rotund and longer than wide; uniplicate with superimposed alternate multiplication. Foramen large, permesothyrid, labiate. Deltidial plates not exposed.

Ventral interior with large strong teeth not supported by dental plates. Pedicle collar strong. Cardinalia with strong, inner socket plate and deep sockets. Crural bases thin short, crural process attached at end of hinge-plate. Loop short and wide, descending lamellae short and flaring laterally; transverse ribbon slightly arched.

Genotype: *Rhynchonella aequiplicata* Gabb, Geol. Surv. California, Pal., 1: 35, pl. 6, fig. 37. 1864.

Externally resembles the Permian *Hemiptychina* but differs in not possessing dorsal septal plates and in the shorter, wider loop.

Oleneothyris Cooper, n. gen.

Large, sulcate, with smooth exterior. Beak erect, foramen large, mesothyrid, marginate to labiate. Deltidial plates concealed in adults.

Ventral hinge teeth supported by callus only; ventral muscular area pyriform in outline, situated anterior to the teeth. Cardinalia with strong, high inner socket ridges corrugated on the surface facing the socket; exterior hinge-plates short, moderately concave and united with a short crural base extending posteriorly nearly to the cardinal process. Crural processes moderately long, bluntly pointed; descending lamellae short and stout, produced anteriorly into moderately long processes. Transverse band directed slightly posteriorly and strongly ventrally to form an inverted V. Cardinal process large. Dorsal adductor scars located near the middle of the valve and lying anterior of a low and wide median ridge, pyriform in outline and fairly large.

Genotype: *Terebratula harlani* Morton, Amer. Journ. Sci. 18: 250, pl. 3, fig. 16. 1829. Reference specimens U.S.N.M. nos. 559395–559397.

Differs from *Terebratula* s.s. in having a greater development of inner socket ridges, broader crural bases, stouter crural processes, and the transverse band of loop in form of an inverted V.

Choristothyris Cooper, n. gen.

Shell thick, small, subcircular in outline with a narrow, slightly curved hinge. Anterior commissure sulcate, surface multicostate to plicate. Beak suberect to erect; foramen large, submesothyrid; deltidial plates small, disjunct.

Ventral interior with large teeth having deep fossettes in callus supporting them. Muscular area large and flabellate, divided by a low but stout median ridge. Cardinalia strong with inner socket ridges strong and high, bounding deep and wide sockets. Hinge-plates small, concave. Crural bases short and stout; loop terebratelliform with long slender crural processes. Cardinal process ponderous. Adductor impressions on each side of a high, thin median septum reaching to the center of the valve.

Genotype: *Terebratula plicata* Say, Amer. Journ. Sci. 2: 43. 1820. Reference specimens U.S.N.M. nos. 2395, 103556.

Differs from *Terebratella* in its angularly costate exterior and cardinalia. The hingeplate of *Terebratella* is deeply concave and united with the median septum, and its cardinal process is a small callosity at the

beak. The cardinal process of *Choristothyris* has a strong shaft with trilobed myophore occupying the space between the crural bases.

Atrypella shrocki Cooper, n. sp.

Shell of about average size for the genus, slightly longer than wide; lateral margins rounded, anterior margin truncated. Greatest width at about the middle. Dorsal valve the deeper, and with gentle convexity in lateral profile but strongly convex in anterior profile. Ventral valve with strongly incurved beak; gently swollen in the umbonal and medial regions but depressed in the anterior third to form a shallow sulcus; ventral tongue short, bent almost at right angles to the lateral commissure and with narrowly rounded extremity. Dorsal valve with short narrowly rounded fold in the anterior third somewhat tumid in the median region and with steep slopes to the lateral margins. Surface smooth. Measurements of holotype: Length, 18 mm; width, 16.7 mm; thickness, 11.6 mm.

Holotype: U.S.N.M. no. 108210a. Paratype: U.S.N.M. no. 108210b.

Horizon and locality: Silurian (Huntington limestone), $SE\frac{1}{4}SW\frac{1}{4}$ sec. 29, T. 27 N., R. 1 E., 3 miles east-northeast of the bridge over the Wabash River at Georgetown, Indiana. Named after Dr. R. R. Shrock, who discovered the species.

Suggests the common *Atrypa phoca* Salter of the Arctic but differs in having a more elongate outline, deeper sulcus, narrower and more elevated fold, and less convex dorsal valve.

Trigonirhynchia sulcata Cooper, n. sp.

Uncinulus stricklandi (auct. not Sowerby) Bassler, U. S. Nat. Mus. Bull. **92**: 1312. 1915.

Large, subtriangular, slightly wider than long with greatest width in anterior third. Lateral margins curving gently to the narrowly rounded anterolateral extremities. Anterior margin straight. Surface marked by 20–26 costae, 6–9 on the fold, 7–9 on the flanks.

Ventral valve shallow, gently and evenly convex in lateral profile. Sulcus broad and shallow, originating in posterior third; tongue long, anteriorly rounded and bent at right angles to the valve surface. Flanks narrowly convex. Beak small, pressed onto the dorsal umbo.

Dorsal valve the deeper, posterior half most convex in lateral profile, anterior half nearly flat. Fold low, defined in the front half, flanks gently convex and very steep-sided.

The holotype has a length of 30 mm, width of 32 mm, thickness 23.7 mm, and width of fold of 19.5 mm.

Holotype: U.S.N.M. no. 108553.

Horizon and locality: Waldron shale, Waldron, Indiana.

This species has been generally identified with *Uncinulus stricklandi* (Sowerby) of the British Silurian but differs in its wider and shallower sulcus and narrower, less strongly defined fold.

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GEOLOGY —*Atlantic coastal "terraces."*[1] Richard Foster Flint, Yale University. (Communicated by G. Arthur Cooper.)

The problem of the Pleistocene[2] "terraces" along the Atlantic coast of the United States from New Jersey to Florida breaks down into three subsidiary questions: (1) How much of the Coastal Plain was covered by the sea at any time during the Pleistocene? (2) What definite strandlines are present? (3) What is the cause of the striking difference in Pleistocene deposits and topography between the regions north and south of the James River? On all three questions confusion of marine features with fluvial features must be avoided. Each of these questions will be considered briefly:

Area covered by the sea.—Three lines of evidence help to fix the area covered by the sea at one time or another: *sediments, fossils,* and *topography.*

Sediments appear to be better size-sorted in the marine littoral zone than under most stream conditions, and they commonly contain less ferruginous and kaolinitic material than do stream deposits. Types of stratification may be much the same in both marine and fluvial deposits, but cut-and-fill bedding is certainly fluvial and not marine. Judged on these characters, the sediments below an altitude of about 100 feet in southern Virginia and below 160 feet in Georgia appear to be mainly marine, whereas nowhere north of the James River do sediments that are thought to be marine occur higher than 50 feet.

Between the James River and Florida the average grain size of the Pleistocene sediments is finer than the surface exposures indicate, for borings and rare deep cuts exhibit a change downward from the common surface sand and silt to stratified silt and clay. The coarse surface sediments may represent offlapping deposits laid down in the littoral zone.

Fossils: No Pleistocene marine fossils had been reported from the Atlantic Coastal Plain from altitudes higher than 28 feet until Hyyppä found a marine diatom flora in a deposit, apparently Pleistocene, sampled by Stephen Taber near McBeth, S. C., with a surface altitude of about 70 feet.[3] Surface samples are commonly barren, but the finer subsurface sediments in the region south of the James River offer a promising field for diatom studies as borings and other excavations open them up.

Topography: The evidence afforded by topography is good. Cooke, Monroe, and others have described bars and swales in various districts between the James River and Florida. The bars are numerous and massive and include hooked spits. They occur as high as 100 feet altitude in southern Virginia, 180 feet in Georgia, and 240 feet in north-central Florida. In general, they become more numerous and more massive from the James River southward. None has been reported from the region north of the James at altitudes greater than 50 feet.

These bars are marine features without doubt, but they do not fix the sea *levels* of the times when they were built, because the tops of bars that are being fashioned by the sea at present occur through a wide range of vertical positions extending well above and well below the surface of the sea itself.

Definite strandlines.—Ordinarily it is easier to determine that the sea has stood

[1] Received May 25, 1942.
[2] For the purposes of this paper, the Pleistocene is considered to represent the time from the Pliocene to the present.
[3] Flint, R. F., *Pleistocene features of the Atlantic Coastal Plain.* Amer. Journ. Sci. **238**: 780. 1940.